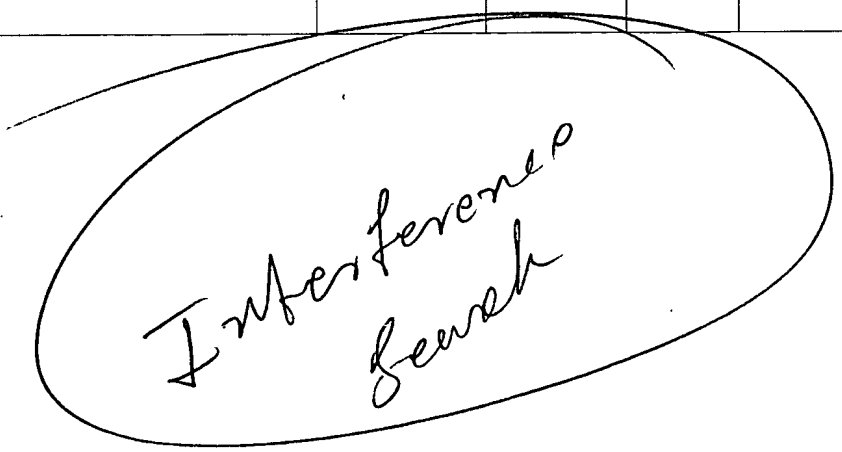
EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	9	meter near2 (bias adj voltage)	USPAT	OR	OFF	2007/03/17 15:21
L2	18	((power or revenue or electronic) adj2 meter) with (bias adj voltage)	USPAT	OR	ON	2007/03/17 17:42
L3	2	((power or revenue or electronic) adj2 meter) with (bias adj voltage)	US-PGPUB	OR	ON	2007/03/17 18:05
L4	27	("4316262" | "4335447" | "4361838" | "4540849" | "4578536" | "4594545" | "4697182" | "4701858" | "4833618" | "4856054" | "4884021" | "4987363" | "4999575" | "5059896" | "5216357" | "5454024" | "5471137" | "5473322" | "5544089" | "5627759" | "5682422" | "5699276" | "5767790" | "6295449").PN. OR ("6665620"). URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/03/17 16:34
L5	0	((power or revenue or electronic) adj2 meter) and ((bias adj voltage) with boost$3 with ac with voltage)	USPAT	OR	ON	2007/03/17 17:50
L6	7	((bias adj voltage) with boost$3 with ac with voltage)	USPAT	OR	ON	2007/03/17 17:50
L7	60	((bias adj voltage) with adjust$3 with ac with voltage)	USPAT	OR	ON	2007/03/17 18:01
L8	2	((power or revenue or electronic) adj2 meter) and ((bias adj voltage) with adjust$3 with ac with voltage)	USPAT	OR	ON	2007/03/17 17:50
L9	17	((dc adj bias adj voltage) with adjust$3 with ac with voltage)	USPAT	OR	ON	2007/03/17 18:02
L10	2	(((power or revenue or electronic) adj2 meter) and (bias adj voltage)). clm.	US-PGPUB	OR	ON	2007/03/17 18:05



EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp

EAST Search History

S1	226	("4617566"|"4680704"|"4688038"|"4700280"|"4868877"|"4964138"|"5151866"|"5239584"|"4827514"|"4912722"|"5053766"|"5115448"|"5194860"|"5214587"|"5229996"|"5260943"|"5285469"|"5319679"|"5345225"|"5359625"|"5383134"|"5432507"|"5461558"|"5544036"|"5559870"|"5592470"|"5640679"|"6067029"|"6073174"|"6078251"|"4209826"|"4611333"|"4707852"|"4841545"|"5032833"|"5140511"|"5287287"|"5619685"|"5910799"|"6000034"|"3858212"|"3973240"|"4056107"|"4156273"|"4204195"|"4250489"|"4254472"|"4319358"|"4321582"|"4361890"|"4389702"|"4405829"|"4415896"|"4466001"|"4504831"|"4506386"|"4525861"|"4566060"|"4608699"|"4628313"|"4638298"|"4692761"|"4713837"|"4728950"|"4734680"|"4749992"|"4757456"|"4769772"|"4783748"|"4839645"|"4860379"|"4862493"|"4866587"|"4884021"|"4922399"|"4940976"|"4956761"|"4958359"|"4965533"|"4972507"|"4975592"|"5019955"|"5022046"|"5053774"|"5056107"|"5079715"|"5086292"|"5090024"|"5132985"|"5136614"|"5155481"|"5166664"|"5177767"|"5179376"|"5225994"|"5228029"|"5239575"|"5243338"|"5252967"|"5270704"|"5280498"|"5280499"|"5289497"|"5307349"|"5315531"|"5381462"|"5384712"|"5387873"|"5406495"|"5416917"|"5420799"|"5432815"|"5438329"|"5448570"|"5450088"|"5452465"|"5455544"|"5457621"|"5473322"|"5475742"|"5475867"|"5491473"|"5493287"|"5495239"|"5497424"|"5511188"|"5519388"|"5526389"|"5528597"|"5539775"|"5541589"|"5553094"|"5590179"|"5602744"|"5631636"|"5691715"|"5696765"|"5715390"|"5748104"|"5751914"|"5751961"|"5754772"|"5696501"|"5778368"|"5787437"|"5790789"|"5805712"|"5808558"|"5822521"|"5862391"|"5872774"|"5874903"|"5875183"|"5875402"|"5897607"|"5898387"|"5943375"|"5963146"|"6041056"|"6078909"|"6088659"|"6112192"|"6150955"|"6160993"|"6172616"|"6199068"|"6246677"|"3455815"|"3878512"|"3976941"|"4031513"|"4132981"|"4190800"|"4218737"|"4438485"|"4497017"|"4600923"|"4607320"|"4614945"|"4622627"|"4623960"|"4631538"|"4644321"|"4653076"|"4724435"|"4749892"|"4761725"|"4940974"|"5067[illegible]	USPAT	OR	OFF	2005/06/22 16:04

EAST Search History

S2	62	S1 and meter and power adj supply	USPAT	OR	OFF	2005/06/22 16:04
S3	9	S1 and meter and power adj supply and ac with dc	USPAT	OR	OFF	2005/06/22 16:05
S4	11	S1 and meter and power adj supply and ac and dc and diode	USPAT	OR	OFF	2005/06/22 16:40
S5	541	power adj supply with ac with dc with diode	USPAT	OR	OFF	2005/06/22 16:42
S6	3	power adj supply with ac with adjust$4 with dc with diode	USPAT	OR	OFF	2005/06/22 16:57
S7	252	power adj supply same adjust$4 with ac with dc	USPAT	OR	OFF	2005/06/22 16:59
S8	19	power adj supply same adjust$4 adj ac with dc	USPAT	OR	OFF	2005/06/22 17:03
S9	28	power adj supply same adjust$4 adj dc with ac	USPAT	OR	OFF	2005/06/22 17:05
S10	0	power adj supply same adjust$4 adj dc adj for adj ac	USPAT	OR	OFF	2005/06/22 17:05
S11	1830	(meter with comprising and power adj supply)	USPAT	OR	OFF	2005/06/22 17:29
S12	148	(meter with comprising with power adj supply)	USPAT	OR	OFF	2005/07/28 16:20
S13	209	(dc adj power with bias with ac with power)	USPAT	OR	OFF	2005/07/28 16:21
S14	10	(dc adj power with bias with ac with power) and "324"/$.ccls.	USPAT	OR	OFF	2005/07/28 16:31
S15	19	(dc adj power with bias with ac with power) and meter	USPAT	OR	OFF	2005/07/28 16:31
S16	0	create with desir$3 with dc with bias$3 with voltage and diode and capacitor and power adj supply	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2005/09/16 19:18
S17	0	creat$4 with desir$3 with dc with bias$3 with voltage and power adj supply	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2005/09/16 19:19
S18	157	creat$4 with dc with bias$3 with voltage and power adj supply	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2005/09/16 19:18

EAST Search History

S19	38	creat$4 with dc with bias$3 with voltage same power adj supply	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2005/09/16 19:19
S20	3	desir$3 with dc with bias$3 with voltage and power adj supply	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2005/09/16 19:19

EAST Search History

S21	226	("4617566"|"4680704"|"4688038"|"4700280"|"4868877"|"4964138"|"5151866"|"5239584"|"4827514"|"4912722"|"5053766"|"5115448"|"5194860"|"5214587"|"5229996"|"5260943"|"5285469"|"5319679"|"5345225"|"5359625"|"5383134"|"5432507"|"5461558"|"5544036"|"5559870"|"5592470"|"5640679"|"6067029"|"6073174"|"6078251"|"4209826"|"4611333"|"4707852"|"4841545"|"5032833"|"5140511"|"5287287"|"5619685"|"5910799"|"6000034"|"3858212"|"3973240"|"4056107"|"4156273"|"4204195"|"4250489"|"4254472"|"4319358"|"4321582"|"4361890"|"4389702"|"4405829"|"4415896"|"4466001"|"4504831"|"4506386"|"4525861"|"4566060"|"4608699"|"4628313"|"4638298"|"4692761"|"4713837"|"4728950"|"4734680"|"4749992"|"4757456"|"4769772"|"4783748"|"4839645"|"4860379"|"4862493"|"4866587"|"4884021"|"4922399"|"4940976"|"4956761"|"4958359"|"4965533"|"4972507"|"4975592"|"5019955"|"5022046"|"5053774"|"5056107"|"5079715"|"5086292"|"5090024"|"5132985"|"5136614"|"5155481"|"5166664"|"5177767"|"5179376"|"5225994"|"5228029"|"5239575"|"5243338"|"5252967"|"5270704"|"5280498"|"5280499"|"5289497"|"5307349"|"5315531"|"5381462"|"5384712"|"5387873"|"5406495"|"5416917"|"5420799"|"5432815"|"5438329"|"5448570"|"5450088"|"5452465"|"5455544"|"5457621"|"5473322"|"5475742"|"5475867"|"5491473"|"5493287"|"5495239"|"5497424"|"5511188"|"5519388"|"5526389"|"5528597"|"5539775"|"5541589"|"5553094"|"5590179"|"5602744"|"5631636"|"5691715"|"5696765"|"5715390"|"5748104"|"5751914"|"5751961"|"5754772"|"5696501"|"5778368"|"5787437"|"5790789"|"5805712"|"5808558"|"5822521"|"5862391"|"5872774"|"5874903"|"5875183"|"5875402"|"5897607"|"5898387"|"5943375"|"5963146"|"6041056"|"6078909"|"6088659"|"6112192"|"6150955"|"6160993"|"6172616"|"6199068"|"6246677"|"3455815"|"3878512"|"3976941"|"4031513"|"4132981"|"4190800"|"4218737"|"4438485"|"4497017"|"4600923"|"4607320"|"4614945"|"4622627"|"4623960"|"4631538"|"4644321"|"4653076"|"4724435"|"4749002"|"4761725"|"4040974"|"506713	USPAT	OR	OFF	2005/12/08 17:48

EAST Search History

S22	114	S21 and meter	USPAT	OR	OFF	2005/12/08 17:48
S23	59	S21 and meter and battery	USPAT	OR	OFF	2005/12/08 17:48
S24	1	"20050206366"	US-PGPUB; USPAT	OR	OFF	2005/12/08 18:23
S25	0	dc adj bias adj voltage near ac adj voltahe	USPAT	OR	OFF	2005/12/08 18:39
S26	0	dc adj bias adj voltage near ac adj voltage	USPAT	OR	OFF	2005/12/08 18:39
S27	0	dc adj bias adj voltage near ac adj voltage	USPAT	OR	ON	2005/12/08 18:39
S28	0	dc adj bias adj voltage near2 ac adj voltage	USPAT	OR	ON	2005/12/08 18:39
S29	75	(dc adj bias adj voltage) near2 (ac adj voltage)	USPAT	OR	ON	2005/12/08 18:39
S30	36	(dc adj bias adj voltage) near (ac adj voltage)	USPAT	OR	ON	2005/12/08 18:39
S31	66	(meter and (bias adj voltage) and (ac adj voltage) and (swing$4 or acceptable) and (power adj supply))	USPAT	OR	OFF	2006/09/01 18:01
S32	0	(meter and (bias adj voltage) and (ac adj voltage) and (swing$4 or acceptable) and (power adj supply)).clm.	USPAT	OR	OFF	2006/09/01 15:37
S33	0	(meter and (bias adj voltage) and (ac adj voltage) and (swing$4 or acceptable) and (power adj supply)).clm.	USPAT	OR	ON	2006/09/01 15:37
S34	0	(meter and (bias adj voltage) and (ac adj voltage) and (swing$4 or acceptable) and (power adj supply)).clm.	US-PGPUB	OR	ON	2006/09/01 15:37
S35	24	(meter and (bias adj voltage) same (ac adj voltage) and (swing$4 or acceptable) and (power adj supply))	USPAT	OR	OFF	2006/09/01 16:26
S36	4	(meter and (bias adj voltage) same (ac adj voltage) same (swing$4 or acceptable) and (power adj supply))	USPAT	OR	OFF	2006/09/01 15:38
S37	0	(meter and (bias adj voltage) same (ac adj voltage) same (swing$4 or acceptable) same (power adj supply))	USPAT	OR	OFF	2006/09/01 15:38
S38	58	(meter and (bias adj voltage) with (ac adj voltage) and (power adj supply))	USPAT	OR	OFF	2006/09/01 16:26

EAST Search History

S39	17	(meter and (dc adj bias adj voltage) with (ac adj voltage) and (power adj supply))	USPAT	OR	OFF	2006/09/01 16:26
S40	42	S31 not S35	USPAT	OR	OFF	2006/09/01 16:38
S41	1	(power adj supply) with bias$4 with keep with ac with voltage	USPAT	OR	OFF	2006/09/01 17:40
S42	124	(power adj supply) with bias$4 near2 ac with voltage	USPAT	OR	OFF	2006/09/01 17:50
S43	8	dc adj voltage with parallel with bias$4 near2 ac with voltage	USPAT	OR	OFF	2006/09/01 17:51
S44	55	dc with parallel with bias$4 with ac with voltage	USPAT	OR	OFF	2006/09/01 17:56
S45	6	S44 and meter	USPAT	OR	OFF	2006/09/01 17:53
S46	21	dc near2 parallel near2 ac with voltage	USPAT	OR	OFF	2006/09/01 18:00
S47	1	dc near2 parallel near2 ac with voltage with bias$4	USPAT	OR	OFF	2006/09/01 18:00
S48	4	swing$4 adj below with power adj supply	USPAT	OR	OFF	2006/09/01 18:15
S49	0	(dc adj2 bias) with ac near predetermin$4 with power adj supply	USPAT	OR	OFF	2006/09/01 18:16
S50	0	(dc adj2 bias) with (ac near2 predetermin$4) with power adj supply	USPAT	OR	OFF	2006/09/01 18:17
S51	0	(dc adj2 bias) with (ac near2 predetermin$4) with (power adj supply)	USPAT	OR	OFF	2006/09/01 18:17
S52	33	(dc adj2 bias) with (predetermin$4) with (power adj supply)	USPAT	OR	OFF	2006/09/01 18:25
S53	4	(ac adj2 bias) with (predetermin$4) with (power adj supply)	USPAT	OR	OFF	2006/09/01 18:26
S54	296	(ac adj2 voltage) with (predetermin$4) with (power adj supply)	USPAT	OR	OFF	2006/09/01 18:26
S55	13	(ac adj2 voltage) with (predetermin$4) with (power adj supply) and meter	USPAT	OR	OFF	2006/09/01 18:49
S56	2	(("3319074") or ("4206367") or ("4206367")).PN.	USPAT	OR	OFF	2006/09/01 18:49
S57	7	("3225209").PN. OR ("4206367"). URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/09/01 18:54
S58	9	("3319074").URPN.	USPAT	OR	OFF	2006/09/01 18:55

EAST Search History

S59	7	(ac adj voltage with above with predetermined) and (power suply) and meter	USPAT	OR	OFF	2006/09/01 19:26
S60	9	(ac adj voltage with above with predetermined) and (power suply) and meter	USPAT	OR	ON	2006/09/01 19:28
S61	3	(ac adj voltage with above with predetermined) and (power suply) and meter	US-PGPUB	OR	ON	2006/09/01 19:26
S62	4	"6052050"	USPAT	OR	OFF	2006/09/01 19:30

EAST Browser - L7: (60) ((bias adj v... | US 5786991 A | Tag: S,P,T1 | Doc: 26/60 | Format: KWIC

File Edit View Tools Window Help

Courier New 12

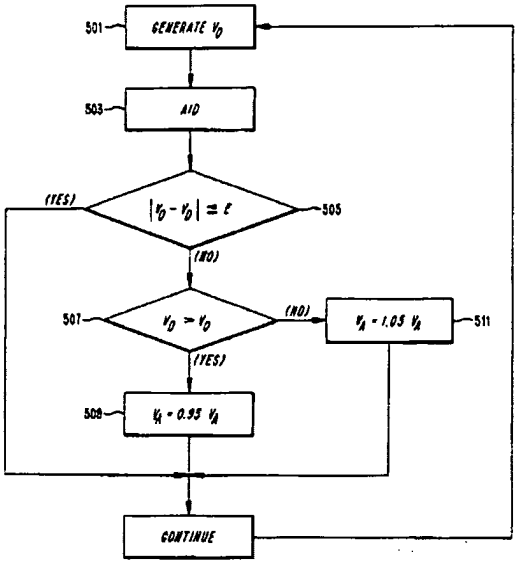


FIG. 5

L7: (60) ((bias adj v... | US 5786991 A | Tag: S,P,T1 | Doc: 26/60 | Format: KWIC

US-PAT-NO: 5786991
DOCUMENT-IDENTIFIER: US 5786991 A
TITLE: Programmable voltage source

Claims Text - CLTX (45):

wherein said means for generating one of a plurality of AC waveforms adjusts the bias voltage by modifying said one of a plurality of AC waveforms based on the bias voltage samples and a desired bias voltage level.

Details Text Image HTML KWIC

					and super short high voltage pul
25	☑	☐	US 5886581 A	19990323	Automatic output offset control
26	☐	☑	US 5786991 A	19980728 10	Programmable voltage source
27	☑	☐	US 5739943 A	19980414 22	Polarization control unit
28			US 5675245 A	19971007 11	Power detector using a constant

Details Text Image HTML

For 10/803213

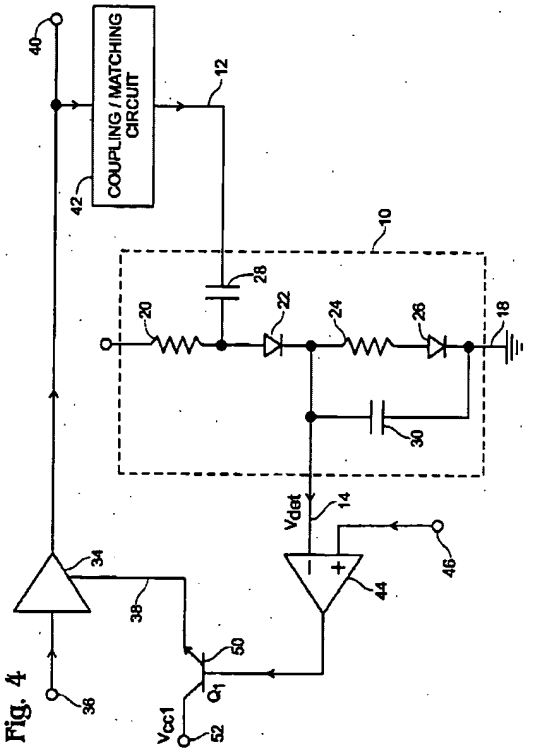


Fig. 4

(18) FIG. 4 is a block diagram showing a control circuit to regulate an ac, or RF, output device power level. Alternately, FIG. 4 can be considered as a depiction of a control circuit for maintaining the output level of an ac, or RF, power device 34 within a predetermined range. Specifically, a variable gain ac, or RF, power amplifier 34 with AGC circuitry to regulate the power level of RF power amplifier 34 is shown. RF power amplifier 34 has an input node, or port, 36 which receives an ac, or RF, input signal from a RF generator or from lower power RF amplifiers. RF amplifier 34 has a RF amplifier gain control port 38 regulated by the ac, or RF, power level control signal to select the amount of gain. RF amplifier 34 also has an output port 40 to supply the ac, or RF, power level.

(19) The RF amplifier output 40 is also interfaced to the coupling circuit 42. Coupling circuit 42 operatively connects the ac, or RF, output power device output 40 to the power detector input port 12. Coupling circuitry 42 attenuates the ac power level to supply a sample portion of the ac power output level to input port 12 of the power detector circuit 10. Alternately, coupling circuitry 42 may be considered a means of sampling the ac power output 40 of an ac, or RF, power device 34 to provide a sampled ac power signal. The impedance of coupling circuitry 42 is designed to provide an optimally matched interface impedance load to the RF amplifier output node 40.

(20) The power detector circuit 10, described in detail as FIG. 1 above, converts the sampled ac power input to the power detector 10 at port 12 into an essentially a dc voltage corresponding to the ac power level at node 14. The ac power level control signal, used to drive the RF amplifier gain control port 38, is derived from the detected power, V.sub.det, at node 14. In the preferred embodiment of the invention, a variable gain control signal amplifier 44 is used to further condition the V.sub.det signal at node 14. The dual input operational simplifier 44 also allows the use of an ac, or RF, power reference signal to select the predetermined power level at RF amplifier output 40. Multiple, selectable, ac power reference signals allow the ac power output level of the cellular radio to be operated at a plurality of predetermined power levels at RF amplifier output 40. Operational amplifier 44 compares V.sub.det of node 14 with the selectable ac power reference signal of node 46 to determine the signal at the operational amplifier output node 48, from which the ac power level control signal is derived.

(21) Transistor 50, with transistor bias voltage V.sub.cc1 at node 52, can also to added to the AGC system to further condition the ac power level control signal provided to the RF amplifier gain control node 38. The AGC system works by adjusting the RF amplifier output 40 until the voltages at the operational amplifier input nodes 14 and 46 are equal.

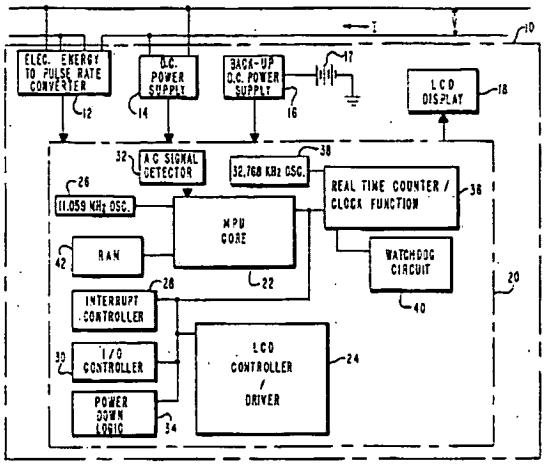


Fig.1

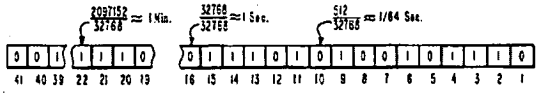


Fig.2

(2) For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

(3) Referring first to FIG. 1, there is shown an AC electric energy meter 10 which includes a logic control circuit 20. The electric energy meter 10 includes an electrical energy to pulse rate converter 12 which is connected in a standard fashion across a source of 60 Hz AC voltage V and current I. The converter 12 provides pulses to the logic control circuit 20 corresponding to the rate of AC electric energy usage. The converter 12 may comprise a standard pulse initiator or other conventional means for producing energy pulses. Also connected across the AC line is a primary DC power supply 14 which is used to produce a constant DC voltage to the logic control circuit 20. The electric energy meter includes a backup, or more particularly a secondary power supply 16 with a battery 17 to provide low current power to the logic control circuit in the event the 60 Hz AC signal from the AC source ceases during a power failure.

(4) The method 10 also includes a display 18 for displaying time-of-use or demand information generated by the logic control circuit 20. In the preferred embodiment, the display 18 is an LCD or liquid crystal display, although other suitable means may be utlized for displaying data from the logic control circuit. The components mentioned thus far are generally standard and well known in the field of electric energy meters and particularly in the field of electronic demand and tariff registers. The logic control circuit includes a microprocessor core 22 which operates as the heart of the logic control circuit. In the preferred embodiment, the microprocessor core is an Intel 8051 that includes an internal ROM, an internal RAM, and a power-down mode, and that is capable of serial communications. The MPU core 22 provides multi-function logic operations and includes software specifically adapted for generating time-of-use, demand, and rate or tariff data for display on the LCD display 18. The MPU core 22 includes software for storing specific programmable time-related events and for monitoring realtime for the occurrence of an event. For instance, in a typical complex tariff register, these time-related events may include programmed days of the month in which the register performs self-reading functions, seasonal changes, holidays, daylight savings changes, leap year, and various billing rate schedules (weekday/weekend rate schedules).

(5) The MPU core 22 provides information to an LCD controller/driver 24

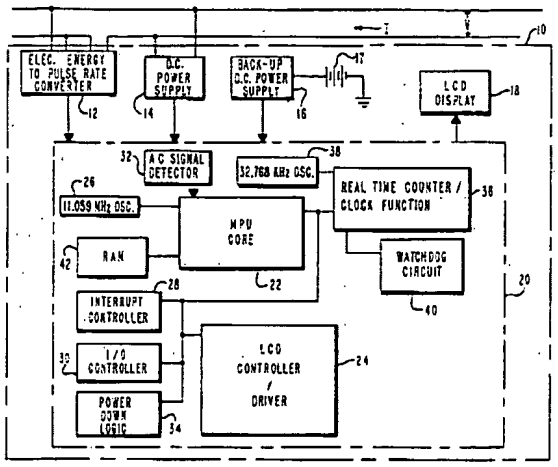


Fig.1

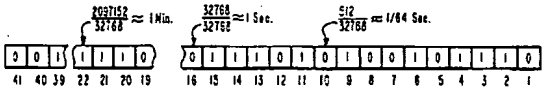


Fig.2

FIELD-OF-CLASSIFICATION-SEARCH: 365/228; 365/229 ; 365/230 ; 377/30 ; 377/32 ; 307/296.4 ; 307/296.5 ; 307/66 ; 324/142 ; 364/483 ; 364/481 ; 368/48

See application file for complete search history

REF-CITED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4197582	April 1980	Johnston et al.	324/142 N/A N/A
4323987	April 1982	Holtz et al.	365/229 N/A N/A
4355361	October 1982	Riggs et al.	364/483 N/A N/A
4400783	August 1983	Locke, Jr. et al.	364/483 N/A N/A
4458307	July 1984	McAnlis et al.	365/228 N/A N/A
4525800	June 1985	Hamerla	364/900 N/A N/A

ART-UNIT: 267

PRIMARY-EXAMINER: Eisenzopf; Reinhard J.

ASSISTANT-EXAMINER: Burns; William J.

ATTY-AGENT-FIRM: Woodard, Emhardt, Naughton Moriarty & McNett

ABSTRACT:

A time registering electric energy meter for measuring usage of an AC energy quantity includes primary and secondary DC power supplies and a microprocessor, having a realtime clock maintained by the 60 Hz AC energy quantity, for maintaining realtime and for generating AC energy usage information determined by a number of time-related events. The meter further includes power outage recovery circuitry for measuring the duration of an outage of the AC energy quantity and for restoring the amount of lost realtime to the realtime clock of the microprocessor upon resumption of the AC energy quantity. The power outage recovery circuitry includes apparatus for iteratively updating the microprocessor realtime clock while comparing the updated realtime with the clock calendar times of the number of time-related events to account for the occurrence of such events during the outage of the AC energy quantity.

15 Claims, 4 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 4

FIG. 7

TIME OF USE		REAL TIME CLOCK 46
238	12:00:00	0
238	14:00:00	0
238	14:00:00	0
238	16:00:00	0
		RAM 44 000 2:00:00
		000 4:00:00
		012 4:00:00
238	16:00:00	0
250	20:00:00	0
250	22:00:00	0

POWER OUT

POWER ON

0 = DON'T CARE

FIG. 8

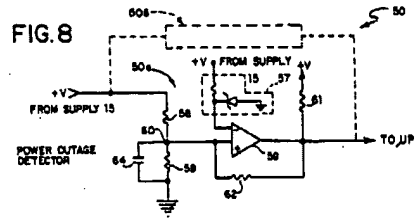
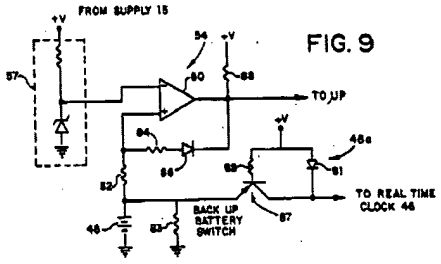


FIG. 9



of the battery 48, which preferably is a lithium battery having a ten year shelf life and over 360 days of battery carryover, is less than a predetermined capacity, the battery remains connected to the clock 46, but no real time elapsed during the power outage will be accumulated. At this time, RAM 44 stores the electrical energy consumption and associated real time data that existed at the beginning of the power outage.

(9) When there is a resumption of power, detected by detector 50, the battery is disconnected from the external clock, energy consumption and real time data stored in the RAM 44 are read by the microprocessor 24, and the elapsed real time accumulated by clock 46 is read by the microprocessor. The real time read from RAM 44 is updated by the elapsed real time read from clock 46, to obtain an updated real time, and the result is stored in the RAM 30. The real time now retained by the microprocessor 24 and incremented by the internal clock 26 is the current real time for correlating with energy consumption data to obtain customer billing.

(10) This process will become more clear with reference to FIG. 7 having a first column labelled "time-of-use" and a second column labelled "real time clock 46". Each row of FIG. 7 includes a day-of-use entry (e.g., 238 in the first entry) which corresponds to a day of, the year (in this example, the 238th day with respect to a reference date, such as January 1) and a time-of-day entry (e.g., 12:00:00 in the first entry corresponds to noon). Each now additionally includes the content of the external real time clock 46, i.e., the time elapsed from the beginning of an outage.

(11) At the time of a power outage ("power out") in the third row of FIG. 7 (day 238 at 4:00 p.m., in this example), data is transferred from the microprocessor to non-volatile RAM 44 and clock 46 is zeroed by microprocessor 24. The real time clock 46 is then connected to battery 48. This is done by detecting the absence of power on power lines P, by means of power outage detector 50. Thereafter, during the elapsed time of the power outage, the real time clock 46 accumulates elapsed real time (days, hours, minutes, seconds), as shown, until there is a resumption of power ("power on"). Assuming that the time interval of line power outage is twelve days and four hours, in this example, power resumption occurs on day 250 at hour 20 (8:00 p.m.). The internal clock 26 is updated by adding the elapsed real time (twelve days, four hours) to the real time previously stored in RAM 44 (day 238, hour 16). Because the updating occurs immediately upon power resumption, no loss of billing information occurs as is the case in Johnston et al, supra.

20	US 4701858 A	19871020	10	Nonvolatile realtime clock calendar module	702/
21	US 4697182 A	19870929	20	Method of and system for verifiable electronic ter following a automatic meter	340/ 324/ 379/

EAST Advanced Find

Find what: 57

Find Next

Area: All, Sel/Cur

Direction: Up, Down

Match word: Whole, Left, Part, Right

Look in: Grid, Documents, Pagemark Comments

Match case

Close

Help

EAST Browser - L2: (18) ((power or r...) | US 6665620 | Tag: 5 | Doc: 3/18 | "Full" 1/19 (Total images 19) | Front Page

File Edit View Tools Window Help

Courier New 12

L2: (18) ((power or r...) | US 6665620 | Tag: 5 | Doc: 3/18 | "Full" 1/19 (Total images 19) | Front Page

US006665620B1

(12) **United States Patent**
Burns et al.

(10) **Patent No.: US 6,665,620 B1**
(45) **Date of Patent: Dec. 16, 2003**

(54) **UTILITY METER HAVING PRIMARY AND SECONDARY COMMUNICATION CIRCUITS**

(75) Inventors: **Gordon R. Burns**, West Lafayette, IN (US); **Byron J. Slater**, Lafayette, IN (US)

(73) Assignee: **Siemens Transmission & Distribution, LLC**, Wendell, NC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/363,018**

(22) Filed: **Jul. 27, 1999**

Related U.S. Application Data

(60) Provisional application No. 60/097,962, filed on Aug. 26, 1998.

(51) Int. Cl.[7] G01R 21/00

(52) U.S. Cl. 702/62; 702/188; 379/106.01; 379/106.02; 379/106.03; 340/870.02; 340/870.03

(58) Field of Search 702/61–63, 122, 702/188; 705/63, 412; 340/870.01, 870.43; 379/106.01, 106.03, 106.04, 106.06, 106.11

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,316,262	A	2/1982	Mizuta et al.	364/900
4,335,447	A	6/1982	Jamin	364/900
4,361,838	A	11/1982	Mizuta	340/870.03
4,540,849	A	9/1985	Oliver	179/2
4,578,536	A	3/1986	Oliver et al.	179/2
4,594,543	A	6/1986	Germer	324/103
4,697,182	A	9/1987	Swanson	340/870.02
4,701,858	A	10/1987	Stokes et al.	364/483
4,833,618	A	5/1989	Verma et al.	364/483
4,856,054	A	8/1989	Smith	379/107
4,884,021	A	11/1989	Hammond et al.	324/142
4,987,363	A	1/1991	Gibbs et al.	324/142
4,990,575	A	3/1991	Germer	324/142
5,059,896	A	10/1991	Germer et al.	324/142
5,216,357	A	6/1993	Coppola et al.	324/142
5,454,024	A *	9/1995	Lebowitz	379/40
5,471,137	A	11/1995	Briese et al.	324/158.1
5,473,322	A	12/1995	Carney	340/870.02
5,544,089	A	8/1996	Hemminger et al.	364/492
5,627,759	A	5/1997	Bearden et al.	364/483
5,682,422	A	10/1997	Oliver	379/107
5,699,276	A *	12/1997	Roos	364/514 A
5,767,790	A	6/1998	Jovellana	340/870.02
6,295,449	B1 *	9/2001	Westerlage et al.	455/422

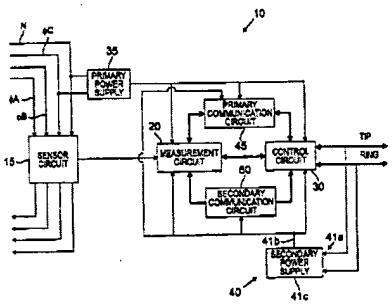
* cited by examiner

Primary Examiner—Marc S. Hoff
Assistant Examiner—Sam H. Choi
(74) *Attorney, Agent, or Firm*—Maginot, Moore & Beck

(57) **ABSTRACT**

A communication system for a utility meter that has a primary power supply includes a primary communication circuit and a secondary communication circuit. The primary power supply is operable to receive a primary electrical power from a primary power source and generate a primary bias power therefrom. The primary communication circuit is operable to effectuate external communications when the primary electrical power from the primary power source is present. The secondary communication circuit is operable to effectuate external communications when the primary electrical power from the primary power source is interrupted.

26 Claims, 5 Drawing Sheets



Details | Text | Image | HTML | Full

L2: (18) ((power or r...) | US 6665620 B1 | Tag: 5 | Doc: 3/18 | Format: KWIC

US-PAT-NO: 6665620
DOCUMENT-IDENTIFIER: US 6665620 B1
TITLE: Utility meter having primary and secondary communication circuits

Detailed Description Text - DETX (74):

When the primary electrical power to the meter 10 is restored, the primary power supply 35 again produces the DC bias voltage of approximately 5.7 volts at the primary power supply output 35b. The DC bias voltage from the primary power supply 35 then provides a voltage high enough to reverse bias the third protection diode 54. As a result, the secondary bias power generated by the secondary power supply 40 does not propagate through the third protection diode 54, thereby effectively eliminating the power demands on the secondary power supply 40.

Details | Text | Image | HTML | KWIC

					apparatus	
9	☑	☐	US 6018701 A	20000125	5	False null prevention in optical delay line	702/
10	☑	☐	US 5655041 A	19970805	13	Method and apparatus for active alignment of	385/
11	☑	☐	US 5343324 A	19940830	11	Bias control and method for electro-optic modulators	398/
12	–	–	US 4999575 A	19910312	17	Power supply and monitor for	324/

Details | Text | Image | HTML

backup power
interruption of power

EAST Browser - L4: (27) ("4316262" |... | US 4697182 | Tag: S | Doc: 21/27 | "Full" 7/20 (Total images 20) | Drawings

File Edit View Tools Window Help

Courier New 12

L4: (27) ("4316262" |... | US 4697182 | Tag: S | Doc: 21/27 | "Full" 7/20 (Total images 20) | Drawings

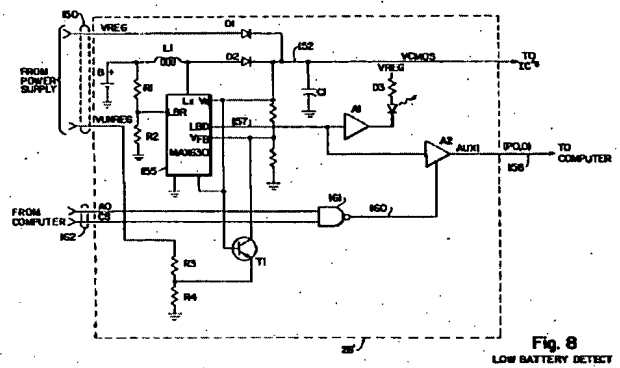


Fig. 8
LOW BATTERY DETECT

Details Text Image HTML Full

L4: (27) ("4316262" |... | US 4697182 A | Tag: S | Doc: 21/27 | Format: FRO

US-PAT-NO: 4697182
DOCUMENT-IDENTIFIER: US 4697182 A
TITLE: Method of and system for accumulating verifiable energy demand data from remote electricity meters
DATE-ISSUED: September 29, 1987

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Swanson; Scott C.	Roswell	GA	N/A	N/A

ASSIGNEE INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Sangamo Weston, Inc.	Norcross	GA	N/A	N/A	02

APPL-NO: 06/949899
DATE FILED: April 9, 1986

PARENT-CASE:

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of application Ser. No. 776,719 filed Sept. 16, 1985, now U.S. Pat. No. 4,639,728.

INT-CL-ISSUED: [04] G08C019/16

INT-CL-CURRENT:

TYPE	IPC DATE
CIPS	G01 R 31/36 20060101
CIPS	G01 R 11/00 20060101
CIPS	G01 R 11/64 20060101
CIPS	G01 R 11/16 20060101
CIPS	G01 R 21/00 20060101
CIPS	G01 R 21/133 20060101
CIPN	G01 R 22/00 20060101

US-CL-ISSUED: 340/870.02 ; 340/310A

Details Text Image HTML FRO

EAST Advanced Find

Find what: battery
Find Next
Match case
Close
Help
Area: All, Sel/Cur
Direction: Up, Down
Match word: Whole, Left, Part, Right
Look in: Grid, Documents, Pagemark Comments

r reading system
reading 340/
recovery method 714/
s for demand
reading system 713/

Details Text Image HTML

L4: (27) ("4316262" |... | US 4697182 | Tag: S | Doc: 21/27 | "Full" 1/20 (Total images 20) | Front Page

United States Patent [19]

Swanson

[11] **Patent Number: 4,697,182**

[45] **Date of Patent: Sep. 29, 1987**

[54] **METHOD OF AND SYSTEM FOR ACCUMULATING VERIFIABLE ENERGY DEMAND DATA FROM REMOTE ELECTRICITY METERS**

[75] Inventor: Scott C. Swanson, Roswell, Ga.

[73] Assignee: Sangamo Weston, Inc., Norcross, Ga.

[21] Appl. No.: 849,899

[22] Filed: Apr. 9, 1986

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 776,719, Sep. 16, 1985, Pat. No. 4,639,728.

[51] Int. Cl.⁴ G08C 19/16

[52] U.S. Cl. ..... 340/870.02; 340/310 A

[58] Field of Search ..... 340/310 A, 870.3, 870.2, 340/637; 179/7 AM; 364/483; 324/433; 307/66

[56] References Cited

U.S. PATENT DOCUMENTS

3,114,900 12/1963 Anderson 340/870.03

4,085,287 4/1978 Kallmann et al. ..... 340/870.02 X

4,504,831 3/1985 Jahr et al. 340/870.03

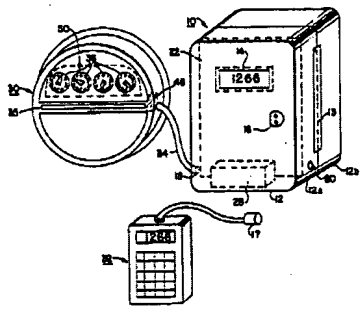
Primary Examiner—Jerry W. Myracle

Attorney, Agent, or Firm—Dale Gaudier

[57] **ABSTRACT**

A solid state electricity demand recorder (10) is controlled by a programmable microprocessor (38) to obtain energy demand survey and billing data. The accumulated count of pulses during a record interval is compared with an encoded register reading obtained from an electricity meter (30) at the end of the record. If there is acceptable correlation between the accumulated count and encoded meter reading, the interval pulse counts associated with that record are deemed verified. Power for the recorder (10) is obtained from the power line, except during power outages in which case a battery (28) provides back-up power. Error conditions such as power outages, meter failure, and low battery condition are automatically detected and communicated to the central computer for remedial action by the electrical utility.

20 Claims, 15 Drawing Figures



L4: (27) ("4316262" |... | US 4697182 A | Tag: S | Doc: 21/27 | Format: FRO

US-PAT-NO: 4697182
DOCUMENT-IDENTIFIER: US 4697182 A
TITLE: Method of and system for accumulating verifiable energy demand data from remote electricity meters
DATE-ISSUED: September 29, 1987

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Swanson; Scott C.	Roswell	GA	N/A	N/A

ASSIGNEE INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Sangamo Weston, Inc.	Norcross	GA	N/A	N/A	02

APPL-NO: 06/849899
DATE FILED: April 9, 1986

PARENT-CASE:

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of application Ser. No. 776,719 filed Sept. 16, 1985, now U.S. Pat. No. 4,639,728.

INT-CL-ISSUED: [04] G08C019/16

INT-CL-CURRENT:

TYPE	IPC DATE
CIPS	G01 R 31/36 20060101
CIPS	G01 R 11/00 20060101
CIPS	G01 R 11/64 20060101
CIPS	G01 R 11/16 20060101
CIPS	G01 R 21/00 20060101
CIPS	G01 R 21/133 20060101
CIPN	G01 R 22/00 20060101

US-CL-ISSUED: 340/870.02; 340/310A

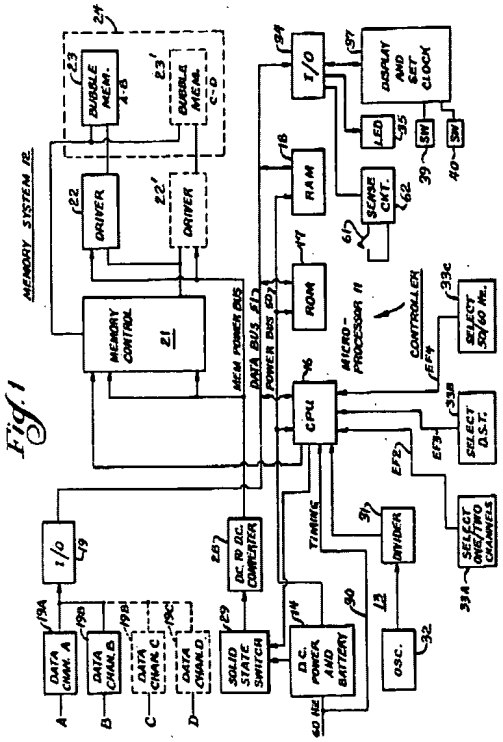


Fig. 1

The Removal Record which is recorded just prior to the time the recorded memory module is removed and after operator actuation of the device 49, includes time reference data representing the month, day, hour and minute of module removal as well as partial period event data. The event data is stored in particular memory locations as defined by a predetermined memory map, which are preassigned to the respective demand intervals. Those locations associated with demand intervals for a partial collection period after removal are filled with zeros (that is, no event measurement data is inserted). The partial collection period event data is stored temporarily in RAM 18 and and transferred just prior to removal of the memory module as indicated. The Removal Record also includes an identifier code which identifies a customer or customers by correlating the memory module with a particular billing recorder from which the memory had been removed. Total pulse counts for the two channels A and B are also recorded as part of the Removal Record.

(16) The Insertion Record is recorded at the end of the partial collection period following insertion of an erased memory module. This record includes time information, month, day, hour and minute of module insertion, and a five digit BCD identifier code. In addition, time data representing the month, day and hour defining the current collection period is recorded as part of the Insertion Record along with any event data stored in RAM 18 at the end of the collection period. The event data is stored in particular memory locations associated with demand intervals for the collection period prior to insertion are filled with zeros.

(17) The recorder circuits normally obtain power from an AC line source, but include battery carryover to maintain selected circuits energized in the event of an AC power outage. A power supply circuit 14 provides the required DC levels for the microprocessor system 11 via a power bus 50. A DC to DC converter 28 is energized by the AC line power or, if that is not present, the battery, via solid state switch 29 under control of the CPU 16 which continuously senses for the presence of the 60 Hz. line signal for determining whether a power outage or failure is present. The converter provides the required DC levels for the bubble memory and its associated drive circuitry, which comprise the magnetic bubble memory system 12. By means of the switch 29, the microprocessor de-energizes the bubble memory system during collection periods and selectively energizes it only for data transfers at access times at the end of normal collection periods or at removal/insertion times.

(18) In the case where the operating temperature specifications of the bubble memory meet or exceed those for the entire recording system, the solid state switch 29 may be energized by the CPU 16 at the end of every data collection period for writing whatever data might have been accumulated during that period, without depleting the battery

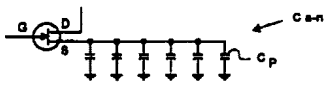


FIG. 5

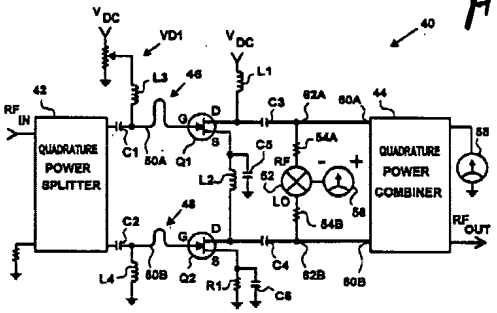


FIG. 7

Amplifier

- Power meter.

US-PAT-NO: 6650180
DOCUMENT-IDENTIFIER: US 6650180 B2
See image for Certificate of Correction
TITLE: Totem pole rf amplifiers with phase and amplitude correction

Detailed Description Text - DETX (51):

Referring again to FIG. 7, equalization of the amplitudes of the rf signals is achieved by adjusting the bias voltage that is supplied to the gate of the FET Q1 by the variable voltage divider VD1 while observing consequent reductions in power loss as indicated by the power meter 58. This adjustment of the gate voltage for the FET Q1 reproportions the bias voltage that is applied to the gate of the FET Q1, thereby selectably proportioning the voltages across the FETs Q1 and Q2, and selectably reproportioning the gains of the FETs Q1 and Q2.

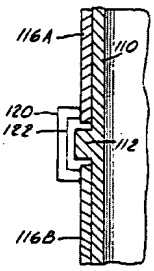
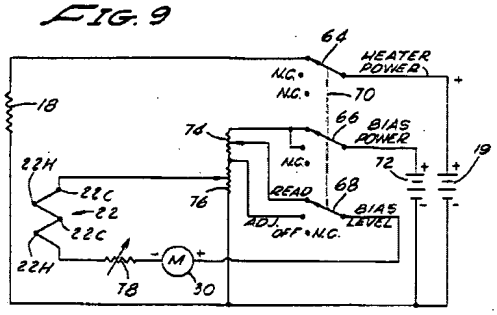


FIG. 8

FIG. 9



US-PAT-NO: 4796471
DOCUMENT-IDENTIFIER: US 4796471 A
TITLE: Techniques useful in determining liquid levels

Detailed Description Text - DETX (20):

2. The ganged arms of switches 64,66, and 68 are then moved to their uppermost READ position to initiate heating of the heater 18. After heating conditions stabilize as indicated by a stablized indication on meter 30, the tap on potentiometer 74 is adjusted until the meter 30 again indicates empty. This adjusts the amount of bias voltage that is applied to the meter 30. This adjustment serves to match bias voltage to tank wall characteristics, heater length, and other installation variables. After this adjustment is made the arms of the switches are returned to their intermediate position and the tank is filled with liquid to its full condition.

				protection circuit	
9	☑ ☐	US 3902970 A	19750902	7	Flow-through amperometric measuring system and method 205/